

CLAIMS

What is claimed is:

1. A method handshaking between two digital subscriber loop (DSL) modems, the method comprises:

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transmitting, by a central office DSL modem, an initiation signal that utilizes a pattern of symbol times to indicate timing and long range handshake mode;

interpreting, by a remote DSL modem, the initiation signal to be a C-SYNC signal or a C-TONE signal, wherein the C-SYNC signal indicates a synchronous mode of handshaking;

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when the initiation signal was interpreted to be the C-SYNC signal, preparing, by the remote DSL modem, a response signal that is an R-SYNC signal, an R-TONE signal, or an R-FLAG signal in response to the C-SYNC signal, wherein the R-SYNC signal includes an acceptance of the synchronous mode of the handshaking;

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providing, by the remote DSL modem, the response signal to the central office DSL modem;

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interpreting, by the central office DSL modem, the response signal to determine whether the response signal is the R-SYNC signal, the R-TONE signal, or the R-FLAG signal;

when the response signal is the R-SYNC signal, providing, by the central office DSL modem, a C-GALF signal to indicate symbol rate for the synchronous mode of the handshaking to the remote DSL modem;

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in response to the C-GALF signal, providing, by the remote DSL modem, the R-FLAG signal in accordance with the symbol rate for the synchronous mode of the handshaking; and

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in response to the R-FLAG signal, providing, by the central office DSL modem, a C-FLAG signal in accordance with the symbol rate for the synchronous mode of the handshaking.

- 5 2. The method of claim 1 further comprises:

the central office DSL modem transmitting the initiation signal in response to an R-TONE-REQ signal from the remote DSL modem, wherein the R-TONE-REQ signal requests initiation of a DSL communication.

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3. The method of claim 1 further comprises:

when the initiation signal was interpreted to be the C-TONE signal:

- 15 preparing, by the remote DSL modem, the response signal to be the R-TONE signal for full duplex DSL communication; or

preparing, by the remote DSL modem, the response signal to be the R-FLAG signal for half duplex DSL communication.

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4. The method of claim 3 further comprises:

in response to the R-TONE signal, providing, by the central office DSL modem, the C-GALF signal to indicate a symbol rate for the full duplex DSL communication;

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in response to the C-GALF signal, providing, by the remote DSL modem, the R-FLAG signal to indicate that the remote DSL modem is ready for the full duplex DSL communication at the symbol rate; and

in response to the R-FLAG signal, providing, by the central office modem, the C-FLAG signal to indicate that the central office DSL modem is ready for the full duplex DSL communication at the symbol rate.

5 5. The method of claim 3 further comprises:

in response to the R-FLAG signal, transmitting, by the central office DSL modem, silence to indicate a readiness for the half duplex DSL communication.

10 6. The method of claim 1 further comprises:

when the initiation signal was interpreted to be the C-SYNC signal, not acknowledging the synchronous mode of the handshake by:

15 preparing, by the remote DSL modem, the response signal to be the R-TONE signal for full duplex DSL communication; or

 preparing, by the remote DSL modem, the response signal to be the R-FLAG signal for half duplex DSL communication.

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7. The method of claim 1, wherein the providing, by the central office DSL modem, a C-GALF signal comprises:

25 to indicate a duplex half symbol rate (DHSR) mode, transmitting the C-GALF signal using a DHSR modulation; and

 to indicate a TCM-ISDN Timing Reference (TTR) synchronized (TTRS) mode, transmitting the C-GALF signal using a TTRS modulation.

30 8. The method of claim 1 further comprises:

subsequent to providing the R-FLAG and C-FLAG signals, exchanging DSL capabilities between the central office DSL modem and the remote DSL mode in accordance with the symbol rate for the synchronous mode.

5 9. The method of claim 1 further comprises:

when the response signal is interpreted to be the R-TONE signal or the R-FLAG signal, retransmitting, by the central office DSL modem, the C-SYNC signal until the response signal is the R-SYNC signal or a retry period is exhausted.

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10. The method of claim 9 further comprises:

when the retry period is exhausted:

15 accepting, by the central office DSL modem, the R-TONE signal or the R-FLAG signal;
or

terminating, by the central office DSL modem, the handshaking.

11. A method for a central office digital subscriber loop (DSL) modem to participate in a DSL handshaking with a remote DSL modem, the method comprises:

transmitting a C-SYNC signal that utilizes a pattern of symbol times to indicate timing
5 and long range handshake mode, wherein the C-SYNC signal indicates a synchronous mode of handshaking;

receiving a response signal from the remote DSL modem, wherein the response signal is
an R-SYNC signal, an R-TONE signal, or an R-FLAG signal, wherein the R-SYNC
10 signal includes an acceptance of the synchronous mode of the handshaking;

interpreting the response signal to determine whether the response signal is the R-SYNC
signal, the R-TONE signal, or the R-FLAG signal;

15 when the response signal is the R-SYNC signal, providing a C-GALF signal to indicate symbol rate for the synchronous mode of the handshaking to the remote DSL modem;
and

in response to an R-FLAG signal, providing a C-FLAG signal in accordance with the
20 symbol rate for the synchronous mode of the handshaking.

12. The method of claim 11 further comprises:

transmitting the C-SYNC signal in response to an R-TONE-REQ signal from the remote
25 DSL modem, wherein the R-TONE-REQ signal requests initiation of a DSL communication.

13. The method of claim 11 further comprises:

in response to the R-TONE signal, providing the C-GALF signal to indicate a symbol rate for a full duplex DSL communication, wherein the R-TONE signal indicated the full duplex DSL communication; and

- 5 in response to the R-FLAG signal, providing the C-FLAG signal to indicate that the central office DSL modem is ready for the full duplex DSL communication at the symbol rate.

14. The method of claim 11 further comprises:

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in response to the R-FLAG signal, transmitting silence to indicate a readiness for a half duplex DSL communication, wherein the R-FLAG signal indicated the half duplex DSL communication.

- 15 15. The method of claim 11, wherein the providing the C-GALF signal comprises:

to indicate a duplex half symbol rate (DHSR) mode, transmitting the C-GALF signal using a DHSR modulation; and

- 20 to indicate a TCM-ISDN Timing Reference (TTR) synchronized (TTRS) mode, transmitting the C-GALF signal using a TTRS modulation.

16. The method of claim 11 further comprises:

- 25 subsequent to providing the C-FLAG signal, exchanging DSL capabilities with the remote DSL mode in accordance with the symbol rate for the synchronous mode.

17. The method of claim 11 further comprises:

when the response signal is interpreted to be the R-TONE signal or the R-FLAG signal, retransmitting the C-SYNC signal until the response signal is the R-SYNC signal or a retry period is exhausted.

5 18. The method of claim 17 further comprises:

when the retry period is exhausted:

accepting the R-TONE signal or the R-FLAG signal; or

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terminating the handshaking.

19. A central office digital subscriber loop (DSL) modem comprises:

processing module; and

5 memory operably coupled to the processing module, wherein the memory stores operational instructions that cause the processing module to:

10 transmit a C-SYNC signal that utilizes a pattern of symbol times to indicate timing and long range handshake mode, wherein the C-SYNC signal indicates a synchronous mode of handshaking;

15 receive a response signal from a remote DSL modem, wherein the response signal is an R-SYNC signal, an R-TONE signal, or an R-FLAG signal, wherein the R-SYNC signal includes an acceptance of the synchronous mode of the handshaking;

interpret the response signal to determine whether the response signal is the R-SYNC signal, the R-TONE signal, or the R-FLAG signal;

20 when the response signal is the R-SYNC signal, provide a C-GALF signal to indicate symbol rate for the synchronous mode of the handshaking to the remote DSL modem; and

25 in response to an R-FLAG signal, provide a C-FLAG signal in accordance with the symbol rate for the synchronous mode of the handshaking.

20. The central office DSL modem of claim 19, wherein the memory further stores operational instructions that cause the processing module to:

transmit the C-SYNC signal in response to an R-TONE-REQ signal from the remote DSL modem, wherein the R-TONE-REQ signal requests initiation of a DSL communication.

- 5 21. The central office DSL modem of claim 19, wherein the memory further stores operational instructions that cause the processing module to:

in response to the R-TONE signal, provide the C-GALF signal to indicate a symbol rate for a full duplex DSL communication, wherein the R-TONE signal indicated the full
10 duplex DSL communication; and

in response to the R-FLAG signal, provide the C-FLAG signal to indicate that the central office DSL modem is ready for the full duplex DSL communication at the symbol rate.

- 15 22. The central office DSL modem of claim 19, wherein the memory further stores operational instructions that cause the processing module to:

in response to the R-FLAG signal, transmit silence to indicate a readiness for a half duplex DSL communication, wherein the R-FLAG signal indicated the half duplex DSL
20 communication.

23. The central office DSL modem of claim 19, wherein the memory further stores operational instructions that cause the processing module to provide the C-GALF signal by:

25 to indicate a duplex half symbol rate (DHSR) mode, transmitting the C-GALF signal using a DHSR modulation; and

to indicate a TCM-ISDN Timing Reference (TTR) synchronized (TTRS) mode,
30 transmitting the C-GALF signal using a TTRS modulation.

24. The central office DSL modem of claim 19, wherein the memory further stores operational instructions that cause the processing module to:

subsequent to providing the C-FLAG signal, exchange DSL capabilities with the remote
5 DSL mode in accordance with the symbol rate for the synchronous mode.

25. The central office DSL modem of claim 19, wherein the memory further stores operational instructions that cause the processing module to:

10 when the response signal is interpreted to be the R-TONE signal or the R-FLAG signal, retransmit the C-SYNC signal until the response signal is the R-SYNC signal or a retry period is exhausted.

26. The central office DSL modem of claim 25, wherein the memory further stores
15 operational instructions that cause the processing module to:

when the retry period is exhausted:

accept the R-TONE signal or the R-FLAG signal; or
20 terminate the handshaking.

27. A remote digital subscriber loop (DSL) modem comprises:

processing module; and

5 memory operably coupled to the processing module, wherein the memory stores operational instructions that cause the processing module to:

receive, from a central office DSL modem, an initiation signal that utilizes a pattern of symbol times to indicate timing and long range handshake mode;

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interpret the initiation signal to be a C-SYNC signal or a C-TONE signal, wherein the C-SYNC signal indicates a synchronous mode of handshaking;

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when the initiation signal was interpreted to be the C-SYNC signal, prepare a response signal that is an R-SYNC signal, an R-TONE signal, or an R-FLAG signal in response to the C-SYNC signal, wherein the R-SYNC signal includes an acceptance of the synchronous mode of the handshaking;

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provide the response signal to the central office DSL modem;

when the response signal is the R-SYNC signal, receive, from the central office DSL modem, a C-GALF signal to indicate symbol rate for the synchronous mode of the handshaking to the remote DSL modem; and

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in response to the C-GALF signal, provide the R-FLAG signal in accordance with the symbol rate for the synchronous mode of the handshaking.

28. The remote DSL modem of claim 27, wherein the memory further stores operational instructions that cause the processing module to:

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transmit an R-TONE-REQ signal to the central office DSL modem to request initiation of a DSL communication.

29. The remote DSL modem of claim 27, wherein the memory further stores
5 operational instructions that cause the processing module to:

when the initiation signal was interpreted to be the C-TONE signal:

10 prepare the response signal to be the R-TONE signal for full duplex DSL communication; or

prepare the response signal to be the R-FLAG signal for half duplex DSL communication.

15 30. The remote DSL modem of claim 29, wherein the memory further stores operational instructions that cause the processing module to:

20 in response to the R-TONE signal, receive from the central office DSL modem, the C-GALF signal to indicate a symbol rate for the full duplex DSL communication;

in response to the C-GALF signal, provide the R-FLAG signal to indicate a readiness for the full duplex DSL communication at the symbol rate; and

25 in response to the R-FLAG signal, receive from the central office modem, the C-FLAG signal to indicate that the central office DSL modem is ready for the full duplex DSL communication at the symbol rate.

31. The remote DSL modem of claim 29, wherein the memory further stores
30 operational instructions that cause the processing module to:

in response to the R-FLAG signal, receive from the central office DSL modem, silence to indicate that the central office DSL modem is ready for the half duplex DSL communication.

- 5 32. The remote DSL modem of claim 27, wherein the memory further stores operational instructions that cause the processing module to:

when the initiation signal was interpreted to be the C-SYNC signal, not acknowledging the synchronous mode of the handshake by:

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preparing the response signal to be the R-TONE signal for full duplex DSL communication; or

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preparing the response signal to be the R-FLAG signal for half duplex DSL communication.

33. The remote DSL modem of claim 27, wherein the memory further stores operational instructions that cause the processing module to receive the C-GALF signal from the central office DSL modem by:

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to indicate a duplex half symbol rate (DHSR) mode, receiving the C-GALF signal using a DHSR modulation; and

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to indicate a TCM-ISDN Timing Reference (TTR) synchronized (TTRS) mode, receiving the C-GALF signal using a TTRS modulation.

34. The remote DSL modem of claim 27, wherein the memory further stores operational instructions that cause the processing module to:

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subsequent to providing the R-FLAG signal, exchange DSL capabilities with the central office DSL modem in accordance with the symbol rate for the synchronous mode.

